# JP ;05-304383 (JP, 05-304383, and A (1993) )



## FULL CONTENTS

[Claim(s)]
[Claim 1]Have the following and a heat dissipation fin is provided in one condensing part of said heat pipe, In a heat sink which electronic equipment is attached to an evaporator of another side, and heat produced from electronic equipment is carried to a condensing part with a working fluid, and is emitted from said heat dissipation fin, Said heat pipe comprises a flat container with which a predetermined channel by which two or more hollows currently formed in the plate are compared mutually, and through which a working fluid flows is formed, A heat sink for high-output electronic equipment, wherein a base of this flat container and said heat dissipation fin are unified by soldering.
A heat pipe.
A heat dissipation fin.

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention consists of a heat pipe and a heat dissipation fin, and a heat dissipation fin is provided in heat pipe one condensing part, Electronic equipment is attached to the evaporator of another side, and the heat produced from electronic equipment is especially related with the heat sink for high-output electronic equipment suitable as a heat sink for high-output amplifier about the heat sink emitted from a heat dissipation fin.
[0002]
[Description of the Prior Art]Although a heat pipe can be divided roughly into a siphon type and a wick type, it has the feature that any heat pipe of a method is simple for structure. Since especially the siphon type heat pipe comprises a well-closed container and a working fluid poured in into this container as everyone knows, structure is still easier. Thus, although structure is easy, since it has the characteristic which was excellent in a heat pipe not having a movable part with a large heat transport amount etc., it is used as objects for heating, such as objects for heat transport, such as a heat exchanger and air conditioning, a boiler, and a bath, and is used also as objects for cooling, such as a transistor and a thyristor. The electronic parts currently used for electronic equipment, electric power machinery, etc., especially a semiconductor device are in the tendency of high integration and large-scale-izing, and the generating heat density of an element is also increasing in connection with it. And the heat pipe is used as mentioned above in the effective cooling. For example, the heat pipe is used also for cooling of the high-output amplifier for audios, and also a power transistor. Although the heat sink formed from large-sized extrusion is used for cooling, such high-output amplifier, for example, the amplifier of 200-600W, when the calorific value of a power device becomes large selectively, it is required that heat transfer from an exothermic part to a radiator should be performed quickly. In order to fill the above-mentioned demand, while a heat pipe is constituted from the pipe and water of a copper alloy, between the contacting parts of the condensing part of a heat pipe, and a heat dissipation fin and a heat pipe, and the attaching base part of a heating element ] silicone greases are applied and it considers fixing these with a bolt, unifying and constituting a heat sink. The heat sink constituted in this way is arranged in a sliding direction, the upper part in which the heat dissipation fin is provided is used as a radiator, and a lower part is used as a receiving section to which electronic equipment was attached.

[0003]
[Problem to be solved by the invention]Also with the above-mentioned heat sink, since the heat pipe with a large heat transport amount is used, high-output amplifier can also be cooled suitably, and even when calorific value becomes large selectively, it is thought that it can be coped with to some extent. However, since the section of a pipe is circular, it is difficult to join together so that field contact may be carried out with a heat dissipation fin, and if a line of contact is with a circle, a colander is not obtained, but it is expected that thermal resistance becomes large. It is also pointed out that the assembly cost for carrying out bolting of the time and effort and the heat pipe which apply silicone grease between a heat pipe and a heat dissipation fin, and the heat dissipation fin, etc. become large. This invention is what was proposed in view of the conventional situation which was described above in order to fill the above demands, It aims at there being specifically no thermal contact resistance between a heat pipe and a heat dissipation fin, and being able to radiate heat in a lot of heat, and providing the heat sink for high-output electronic equipment which can be manufactured inexpensive.
[0004]
[Means for solving problem]This invention consists of a heat pipe and a heat dissipation fin to achieve the above objects, A heat dissipation fin is provided in one condensing part of said heat pipe, and electronic equipment is attached to the evaporator of another side, The heat produced from electronic equipment is carried to a condensing part with a working fluid, and in the heat sink emitted from said heat dissipation fin, [ said heat pipe ] It comprises a flat container with which the predetermined channel by which two or more hollows currently formed in the plate are compared mutually, and through which a working fluid flows is formed, and the base of this flat container and said heat dissipation fin is united by soldering.
[0005]
[Function]Electronic equipment, for example, high-output amplifier, is attached to the evaporator of a flat container. Then, it sets so that an evaporator may be located caudad. If it does so, the heat produced with high-output amplifier will be transmitted from a flat container to an internal working fluid, and a working fluid will evaporate. When evaporating, a lot of latent heat is absorbed. And the steam with which steam pressure increased moves to the direction of a condensing part. In a condensing part, heat is transmitted from a flat container to the base of a direct heat dissipation fin, and a heat dissipation fin, it is emitted to the air which is carrying out the free convection from the heat dissipation fin, for example, and a steam is condensed. The condensed working fluid moves to the direction of an evaporator with gravity. A working fluid circulates like the following and high-output amplifier is cooled.
[0006]
[Working example]Although the heat dissipation fin unit shown in the work example of this invention comprises a heat dissipation fin of two or more sheets, and the plate or base supporting these heat dissipation fins, [ a fin unit ] A heat dissipation fin and a plate can also be manufactured by bending from the plate of one sheet, and can form these in a different body, and can also unify them by soldering. However, as for a heat dissipation fin and a base, it is desirable to process it as mold goods in one. It is because process cost can be reduced. Therefore, only the example is shown in the work example of the figure. Although the heat dissipation fin unit constituted as mold goods in one as mentioned above can also be provided only in one side of a flat container, the example provided in both sides is shown in the figure. As for the base of a flat container and a heat dissipation fin, unifying by soldering via brazing sheet is desirable. It is because soldering becomes easy.
[0007]Hereafter, the work example of this invention which carried out the flat container with the roll bond panel is described. The heat sink concerning this example comprises the roll bond panel 1, the heat dissipation fin unit 20 and 20' which are soldered in the field of the upper and lower sides, and the brazing sheets 40, 40, 41, and 41 of four sheets shown in drawing 3 as shown in drawing 1. And these components or members are formed so that it may state below from aluminum or its alloy.
[0008]The roll bond panel 1 has structure which pasted the sheets 2 and 3 of two sheets together as shown in (**) of drawing 1, and the channel of the working fluid is formed in the inside at the predetermined pattern. If the sheets 2 and 3 of two sheets are seen superficially, they are carrying out the rectangle. And the peripheral parts 4 and 5 are stretched, and an inside is also joined in the hollowed parts 6 and 7 which striped size became independent of, portions other than the hollowed part 6 and 7 swell to the method of outside, and the channels 8 and 8 are formed. This state is shown in drawing 2. Thus, as for one end part of the longitudinal direction of the roll bond panel 1 in

which the channels 8 and 8 are formed, the end part of the condensing part 11 and another side is selected by the evaporator 12. There is the pinch processing section 10 in the end of the channel 8, and the working-fluid filling pipe is connected at this pinch processing section 10.

[0009]The heat dissipation fin unit 20 comprises the heat dissipation fins 21 and 22 of two or more sheets, and the plate-like base 23 which is supporting these heat dissipation fins 21 and 22 as shown in (b) of drawing 1. And the heat dissipation fins 21 and 22 and the base 23 are fabricated in this example in one. The heat dissipation fins 21 and 21 located in a side part are comparatively thicker than other heat dissipation fins 22 and 22, it is tall, and the hole of the prescribed depth is drilled in the side, respectively. The height of the heat dissipation fins 22 and 22 located in pars intermedia has not gathered. Therefore, ventilation becomes good and a radiation effect is heightened. the base 23 of the heat dissipation fin unit 20 -- the roll bond panel 1 -- abbreviated -- it is the same area and the same shape is carried out. And the portion in which the heat dissipation fins 21 and 22 are formed in the abbreviation half, and the heat dissipation fins 21 and 22 are formed corresponds to the condensing part 11 of the roll bond panel 1. The end part of another side in which the heat dissipation fins 21 and 22 of the base 23 are not formed becomes thin, and this portion serves as the attaching base part 25 which attaches high-output amplifier. Two or more countersinking holes 26 and 26 are formed in the attaching base part 25, and the end part of the attaching base part 25 has become it with the thick part 27. The holes 28 and 28 are drilled in shaft orientations by the end of this thick part 27. The notches 29 and 29 deeper than the board thickness of the brazing sheets 41 and 41 are formed in the both side surfaces of the base 23 as shown in drawing 1.

[0010]the heat dissipation fin unit 20 which the height of the heat dissipation fins 21' and 22' is only low, and mentioned above structurally the heat dissipation fin unit 20' soldered in the field of another side of the roll bond panel 1 -- abbreviated -- it is the same. Therefore, the same reference mark is attached and duplication explanation is not given. Although the attaching base part 25 of this heat dissipation fin unit 20' does not necessarily require the countersinking hole 28, flexibility will be obtained by attachment of electronic equipment if it provides.

[0011][ the brazing sheets 40 and 40 which intervene at the time of soldering between the roll bond panel 1, and the heat dissipation fin unit 20 and the bases 23 and 23 of 20' ] the roll bond panel 1 or the heat dissipation fin unit 20, and the bases 23 and 23 of 20' -- abbreviated -- it has the same area and an aluminum wax is stretched in the both sides. As for the brazing sheets 41 and 41 soldered at the both side surfaces of the heat dissipation fins 21 and 22, the clad of the aluminum wax is carried out to one side as shown in drawing 3.

[0012]Next, an assembly is explained. The brazing sheets 40 and 40 are made to intervene using a jig etc. between both sides of the roll bond panel 1, and the heat dissipation fin unit 20 and the bases 23 and 23 of 20'. The brazing sheets 41 and 41 are set to the notches 29 and 29 of the side part of the base 23 as shown in drawing 3. It heats and solders with a vacuum furnace in the state where it assembled in this way. Or it solders using fluoride system flux. The heat sink produced commercially after cooling is taken out. Although not shown in a figure, a working fluid is poured in into the channels 8 and 9 of the roll bond panel 1, and 9 through the pinch processing section 10 from a working-fluid filling pipe, and the pinch processing section 10 is stopped. High-output amplifier is attached to the attaching base part 25, for example using the countersinking holes 26 and 26. Or it attaches to both sides, respectively. And high-output amplifier is turned down, and the heat dissipation fin 21 and 22 side is used, making it into the upper part. If it does so, the heat produced with high-output amplifier will be transmitted from the roll bond panel 1 to Uchibe's working fluid via the brazing sheet 40, and a working fluid will evaporate. When evaporating, a lot of latent heat is absorbed. And the steam with which steam pressure increased moves to the direction of the condensing part 11, i.e., the heat dissipation fin 21 and 22 side, through the channels 8 and 8. In the condensing part 11, it is emitted to the air which heat is transmitted from the roll bond panel 1 to the heat dissipation fins 21 and 22 via the brazing sheet 40, for example, is carrying out the free convection, and a steam is condensed. The condensed working fluid moves to the direction of the evaporator 12 with gravity. A working fluid circulates like the following and high-output amplifier is cooled. Since according to this example the brazing sheets 40 and 40 are made to intervene between the roll bond panel 1, and the heat dissipation fin unit 20 and the bases 23 and 23 of 20' and it is soldered, soldering working capacity improves.

[0013]

[Effect of the Invention]According to this invention, as mentioned above, [ a heat pipe ] Comprise a flat container with which the channel through which a predetermined working fluid flows is formed, and, [ this flat container and a heat dissipation fin ] Since it is unified by soldering, the thermal

contact resistance between a flat container and a heat dissipation fin becomes zero, and the effect peculiar to this invention that heat conduction from a working fluid to a heat dissipation fin also becomes good also to a working fluid again is acquired from a heating element. Since two or more hollows currently formed in the plate are compared mutually and formed, the channel through which the working fluid of a heat pipe flows can bear the steam pressure of a working fluid, even if intensity is large and metaphor thickness is thin. Therefore, the heat sink itself can be constituted thinly. Since it is not necessary to make silicone grease intervene between a heat pipe and a heat dissipation fin and bolting does not need it, either, assembly cost can also be reduced.

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[Brief Description of the Drawings]
[Drawing 1]It is an exploded perspective view showing the work example of this invention, and (**) is [ the (b) and (**) are heat dissipation fin units, and ] a perspective view of a roll bond panel.
[Drawing 2]It is the expanded sectional view seen in the direction of arrow X-X in (**) of drawing 1.
[Drawing 3]It is an expansion side view of the work example shown in drawing 1.
[Explanations of letters or numerals]
1 Roll bond panel
8 Channel
11 Condensing part
12 Evaporator
20 and 20' heat dissipation fin unit

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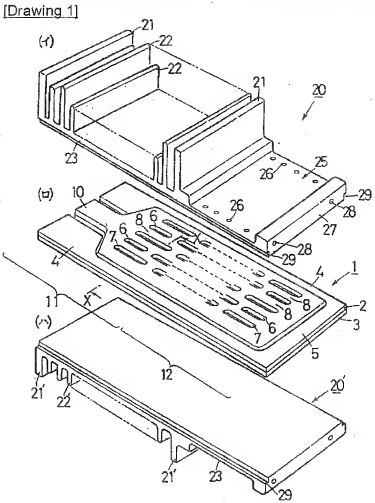
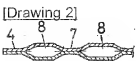
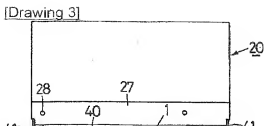
[Drawing 1]




[Drawing 2]



[Drawing 3]




[Translation done.]